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Geology of the Chiniguchi Lake Area

District of Sudbury

by
Burkhard O. Dressler

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FOREWORD

CHINIGUCHI LAKE AREA

The Huronian rocks of Ontario have attracted considerable attention in the past due to their association with significant deposits of uranium and silver. Detailed geological surveys of Huronian rocks have as a result been directed at potential uranium areas north of Lake Huron and silver areas around Cobalt. Large areas, however, have never been mapped. One of these is located in the Cobalt Embayment north of Lake Wanapitei where Chiniguchi Lake is situated.

Huronian rocks of the Cobalt Embayment may have the potential to host Rand-type gold deposits, breccia-hosted gold deposits, and syngenetic base-metal deposits. Due to the importance of stratigraphy in exploration drilling, the existing large gaps in survey data should be filled. This report should be of help in this regard.

V.G. Milne
Director
Ontario Geological Survey

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GEOLOGICAL MAP

(back pocket)

Map 2468–DeMorest, Telfer, and McConnell Townships, District of Sudbury.

Scale 1:31 680 or 1 inch to ½ mile.

CHART

Chart A–Figure 2, Three stratigraphic sections through the Huronian Supergroup.
Figure 3, Structural cross-section, Chiniguchi Lake Area.

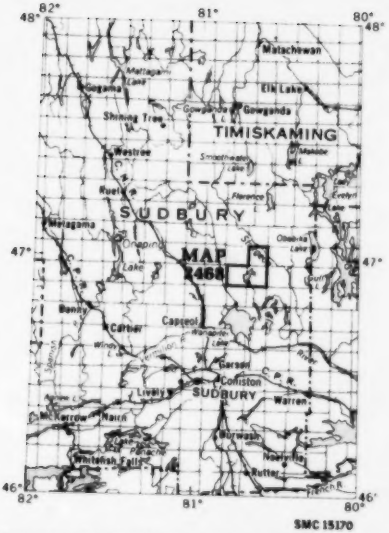

Figure 1–Key map showing location of the Chiniguchi Lake Area.
Scale 1:3 168 000 (1 inch to 50 miles).

ABSTRACT

The centre of the Chiniguchi Lake Area (Figure 1) is located approximately 50 km northeast of Sudbury. It comprises DeMorest, McConnell, and Telfer Townships. Precambrian rocks underlie the map area. These are overlain by Pleistocene and Recent unconsolidated sediments.

Middle Precambrian supracrustal sedimentary rocks of the Huronian Supergroup underlie most of the area and can be subdivided into 6 formations. These are the Mississagi, Bruce, Espanola, Serpent, Gowganda, and Lorrain Formations. The Huronian formations consist mainly of the clastic sediments; arkose, subarkose, wacke, and conglomerate. Chemical sediments such as limestone occur in the Espanola Formation.

The Huronian sedimentary rocks are intruded by Nipissing gabbro. The youngest rock in the area is olivine diabase.

Continental glaciation during the Pleistocene resulted in erosion and deposition of unconsolidated sediments.

Two zones of structural deformation can be recognized in the area. The first is located in the northeastern part of DeMorest Township. It is characterized by folding and faulting that is stronger than that in the second structural zone. The second zone comprises nearly all the map area, and is characterized by wide open folds and faulting along approximately northerly striking faults. Breccias similar to the Sudbury breccia occur in many places in the map area.

No mineralized showings of economic significance are known to exist in that area. The area, however, is not unfavourable to mineral exploration; gold and uranium mineralization was recently discovered by deep exploratory drilling near the Archean-Proterozoic unconformity.

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If the reader wishes to convert imperial units to SI (metric) units or SI units to imperial units the following multipliers should be used:

CONVERSION FROM SI TO IMPERIAL			CONVERSION FROM IMPERIAL TO SI		
SI Unit	*Multiplied by*	*Gives*	*Imperial Unit*	*Multiplied by*	*Gives*
			LENGTH		
1 mm	0.039 37	inches	1 inch	**25.4**	mm
1 cm	0.393 70	inches	1 inch	**2.54**	cm
1 m	3.280 84	feet	1 foot	**0.304 8**	m
1 m	0.049 709 7	chains	1 chain	20.116 8	m
1 km	0.621 371	miles (statute)	1 mile (statute)	**1.609 344**	km
			AREA		
1 cm^2	0.155 0	square inches	1 square inch	**6.451 6**	cm^2
1 m^2	10.763 9	square feet	1 square foot	**0.092 903 04**	m^2
1 km^2	0.386 10	square miles	1 square mile	2.589 988	km^2
1 ha	2.471 054	acres	1 acre	0.404 685 6	ha
			VOLUME		
1 cm^3	0.061 02	cubic inches	1 cubic inch	**16.387 064**	cm^3
1 m^3	35.314 7	cubic feet	1 cubic foot	0.028 316 85	m^3
1 m^3	1.308 0	cubic yards	1 cubic yard	0.764 555	m^3
			CAPACITY		
1 L	1.759 755	pints	1 pint	0.568 261	L
1 L	0.879 877	quarts	1 quart	1.136 522	L
1 L	0.219 969	gallons	1 gallon	**4.546 090**	L
			MASS		
1 g	0.035 273 96	ounces (avdp)	1 ounce (avdp)	28.349 523	g
1 g	0.032 150 75	ounces (troy)	1 ounce (troy)	**31.103 476 8**	g
1 kg	2.204 62	pounds (avdp)	1 pound (avdp)	**0.453 592 37**	kg
1 kg	0.001 102 3	tons (short)	1 ton (short)	**907.184 74**	kg
1 t	1.102 311	tons (short)	1 ton (short)	**0.907 184 74**	t
1 kg	0.000 984 21	tons (long)	1 ton (long)	**1016.046 908 8**	kg
1 t	0.984 206 5	tons (long)	1 ton (long)	**1.016 046 908 8**	t
			CONCENTRATION		
1 g/t	0.029 166 6	ounce (troy)/ ton (short)	1 ounce (troy)/ ton (short)	34.285 714 2	g/t
1 g/t	0.583 333 33	pennyweights/ ton (short)	1 pennyweight/ ton (short)	1.714 285 7	g/t

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1 ounce (troy)/ton (short)	20.0	pennyweights/ton (short)
1 pennyweight/ton (short)	0.05	ounce (troy)/ton (short)

NOTE–Conversion factors which are in bold type are exact. The conversion factors have been taken from or have been derived from factors given in the Metric Practice Guide for the Canadian Mining and Metallurgical Industries published by The Mining Association of Canada in co-operation with the Coal Association of Canada.

Geology of the
Chiniguchi Lake Area
District of Sudbury

By

B.O. Dressler[1]

INTRODUCTION

The centre of the Chiniguchi Lake Area (Figure 1) is located approximately 50 km northeast of Sudbury. It comprises DeMorest Township (Latitudes 46°58′13″ and 47°03′23″N; Longitudes 80°33′46″ and 80°41′23″W), McConnell Township (Latitudes 46°53′26″ and 46°56′13″N, Longitudes 80°33′46″ and 80°41′23″W), and Telfer Township (Latitudes 46°53′26″ and 46°58′13″N, Longitudes 80°41′23″ and 80°49′03″W). The area was mapped during the 1979 field season by the author, John Cass, and Christine Kerr. The most southerly sections of Telfer and McConnell Townships were mapped by the author (Dressler 1982) in 1977 and 1978. Northeastern DeMorest Township was previously mapped by H.D. Meyn (Card *et al.* 1973). No major changes were made on Meyn's map.

Access to the area is provided by several bush roads leading north from Highway 545, just north of Capreol, to the northern part of Chiniguchi Lake. Access to this lake is possible also from River Valley via Highway 805 and gravel roads. A network of secondary bush roads and large lakes provide access to Telfer, McConnell, and the southern part of DeMorest Townships. Northwestern DeMorest Township is accessible only by float-equipped aircraft or by helicopter.

Reconnaissance mapping of the area was carried out by Collins (1917). Areas to the north were mapped in detail by Card *et al.* (1973) in 1967. The region south of the current map area was mapped by Dressler (1982) in 1977 and 1978. Meyn (1971, 1972) mapped the townships to the west. The present project was initiated as a first step to complete the mapping between the areas previously mapped in detail. The mapping was done by overland pace and compass

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traversing, canoeing, and by using four-wheel-drive vehicles. In northwestern DeMorest Township a helicopter was used. Field data were plotted on transparent overlays on air photographs and transferred to a base map of the same scale (1 inch to ¼ mile).

Uncoloured preliminary geological maps of the area were published by the Ontario Geological Survey in 1980 (Dressler *et al.* 1980a, 1980b, 1980c). The area is also covered by aeromagnetic maps (Geological Survey of Canada 1965a, 1965b, 1965c). Both the preliminary maps and the aeromagnetic maps are listed in the references at the end of this report.

Acknowledgments

In 1979, the author was assisted in the field by the following geological assistants: John Cass, Patrick Drew, Gregory Jones, Christine Kerr, and Tim Sweeting. The field assistants who mapped the southernmost portions of McConnell and Telfer Townships were in 1977; Ken Greenwood, Irene Underhill, Roy Underhill, and Gary Lawrence, and in 1978; Christine Kerr, Gregory Finn, Nicole Dupre, and Dan Bray. The senior assistants were: John Cass, Christine Kerr, Gregory Finn, and Gary Lawrence. John Cass and Christine Kerr mapped most of the current map area.

Topography

The Chiniguchi Lake Area is located in the southern part of the Canadian Shield of Ontario. Elevation above sea level is approximately 350 m. Local relief is only about 30 to 50 m. The country is hilly and rugged. There are also extensive flat areas underlain by fluvial and glacial deposits.

The topography is controlled by bedrock lithology and by structure, for example faulting. The Lorrain Formation sandstones are resistant to erosion. These rocks form rather steep-sided hills. The highest hill, just west of Chiniguchi Lake, is 440 m above sea level, and is approximately 120 m above Chiniguchi Lake. Nipissing gabbro also forms hills. The Gowganda Formation, in general, stands at elevations lower than the Lorrain Formation as do the pre-Gowganda Huronian formations in northeastern DeMorest Township. Olivine diabase dikes weather easily and form long and narrow valleys.

GENERAL GEOLOGY

The current map area is underlain by sedimentary rocks of the Huronian Supergroup, Nipissing gabbro, and by olivine diabase (Table 1).

The oldest rocks in the area are sandstones of the Mississagi Formation. They are overlain by polymictic conglomerate of the Bruce Formation which in turn is overlain by limestone and silty mudstone of the Espanola Formation.

TABLE 1 | TABLE OF FORMATIONS FOR THE CHINIGUCHI LAKE AREA.

PHANEROZOIC
CENOZOIC
QUATERNARY
RECENT
Swamp, sand, and gravel.
PLEISTOCENE
Glacial and glaciofluvial sand, silt, and gravel.

Unconformity

PRECAMBRIAN
LATE PRECAMBRIAN
MAFIC INTRUSIVE ROCKS
Olivine diabase.

Intrusive Contact

MIDDLE PRECAMBRIAN
HURONIAN SUPERGROUP
COBALT GROUP
LORRAIN FORMATION
Arkose, subarkosic wacke, arkosic wacke, quartz wacke, minor wacke and conglomerate.
GOWGANDA FORMATION
Wacke, arkose to subarkose, conglomerate.

Unconformity

QUIRKE LAKE GROUP
SERPENT FORMATION
Arkose, wacke.
ESPANOLA FORMATION
Limestone, silty mudstone.
BRUCE FORMATION
Polymictic conglomerate.
HOUGH LAKE GROUP
MISSISSAGI FORMATION
Quartz wacke, subarkosic wacke.

Sandstone and fine-grained argillitic to silty arkose of the Serpent Formation follow upwards in the stratigraphic column and are overlain by the Gowganda Formation. The youngest Huronian formation observed in the area is the Lorrain Formation, which, together with the Gowganda Formation, underlies most of the 3 investigated townships.

The Huronian rocks are intruded by Nipissing gabbro, a tholeiitic gabbro that is approximately 2160 Ma old (Fairbairn *et al.* 1969). The olivine diabase is the youngest component of the bedrock in the area. It belongs to the "Sud-

bury Swarm" and according to Van Schmus (1965) is approximately 1280 Ma old. More recently, Gates and Hurley (1975) obtained a Rb-Sr isochron age of 1460 ± 130 Ma on dikes in the Sudbury area.

A thin discontinuous mantle of glacial deposits was left behind by Pleistocene glaciation.

The pre-olivine diabase rocks are weakly metamorphosed. Metamorphism and deformation are of the same age as the orogenic events that affected the Huronian rocks along the North Shore of Lake Huron. The Chiniguchi Lake Area as part of the "Cobalt Plate" (Stockwell 1964) or "Cobalt Embayment" is therefore part of the Southern Structural Province of the Canadian Shield (Card *et al.* 1973).

Precambrian

MIDDLE PRECAMBRIAN

Huronian Supergroup

Most of the area is underlain by rocks of the Huronian Supergroup. The Gowganda and Lorrain Formations of the Cobalt Group underlie McConnell and Telfer Townships and parts of DeMorest Township. In the northeastern part of DeMorest Township, Hough Lake Group and Quirke Lake Group rocks occur. These older Huronian units were investigated in detail by Card *et al.* (1973). Therefore, these rocks were not re-mapped during the current investigations. The following description of the lower Huronian sedimentary rocks is based mainly on the descriptions given by Card *et al.* (1973). The author of the current report spent only a short time in northeastern DeMorest Township.

Three stratigraphic sections across rocks of the Huronian Supergroup are shown in Figure 2. These are based on 3 deep diamond-drill holes put down in Telfer and DeMorest Townships. A description of these 3 stratigraphic sections, based on an assessment file report, is given in a section which follows the general description of the Huronian sequence.

HOUGH LAKE GROUP

Mississagi Formation

Rocks of the Mississagi Formation are exposed only in the very northeastern part of DeMorest Township. The formation was subdivided by Card *et al.* (1973) into several lithostratigraphic members. The basal member consists of sandstone, argillite, and conglomerate. The middle member consists of medium- to coarse-grained, cream coloured sandstone, is commonly crossbedded, and

contains thin argillite interbeds. The upper member is composed of rusty weathering, pyritic sandstone, interbedded sandstone, and conglomerate and an upper greenish grey, argillaceous pebbly schist. It represents a gradational contact zone with the rocks of the overlying Bruce Formation. In total, the formation is approximately 600 m thick.

In the northeastern part of DeMorest Township, Card *et al.* (1973) encountered only Mississagi Formation sandstones (see Map 2260, Yorston Lake, *in* Card *et al.* 1973). No mudstones or conglomerates appear to be present. Card *et al.* (1973, Table 5, p. 20) present several modal analyses of Mississagi Formation sandstones from the Maple Mountain Area. These sandstones can be classified as quartz wackes and subarkosic wackes (Blackburn *et al.* 1978).

QUIRKE LAKE GROUP

Bruce Formation

Rocks of the Bruce Formation are exposed in northeastern DeMorest Township where the formation is estimated to be roughly 600 m thick (Card *et al.* 1973, p.20). Contacts with the underlying Mississagi Formation and the overlying Espanola Formation are gradational and conformable.

In the Maple Mountain Area (Card *et al.* 1973) the formation consists of polymictic conglomerate and subordinate sandstone and mudstone. In the current area, only the paraconglomerate appears to be present as shown by Card *et al.* (1973) on Map 2260. It is polymictic, commonly containing up to 15 percent of rock clasts that consist of granite, quartz, chert, mudstone, gabbroic rocks, and felsic metavolcanics. The subrounded to angular fragments generally are up to about 7 cm in diameter; however, fragments of boulders size up to 1.2 m across were also observed by Card *et al.* (1973).

The matrix of the Bruce Formation conglomerate is fine grained consisting of small ($\cong$0.3 mm) subangular to subrounded quartz and plagioclase grains set in a finer grained matrix of biotite, chlorite, and sericite. Pyrite is commonly present within the matrix and forms small grains and idiomorphic cubes up to approximately 0.6 mm in size.

The above brief description of the Bruce Formation paraconglomerate is based on the report by Card *et al.* (1973). The reader is referred to it for more information.

Espanola Formation

The Espanola Formation consists of rhythmically interbedded laminated and banded limestone and silty mudstone and, in the current area, is approximately 75 m thick. Bedding thickness varies from 1 mm to 3 cm. The silty mudstone is brown to dark grey, the limestone white to grey. The rocks are rather incompetent and commonly are foliated and folded.

Serpent Formation

Card *et al.* (1973) estimated the Serpent Formation of the current area to be approximately 600 m thick. It conformably overlies the Espanola Formation, and in turn, is unconformably overlain by rocks of the Cobalt Group.

The lower Serpent Formation is composed of sandstone and siltstone similar to upper Espanola Formation rocks. The bulk of the formation consists of medium- to coarse-grained sandstones that in places, contain quartz pebbles and argillaceous wacke interbeds. Card *et al.* (1973, Table 5, p. 20) published 2 modal analyses of sandstone and a siltstone of the Serpent Formation. In the Ontario Geological Survey nomenclature of sedimentary rocks (Blackburn *et al.* 1978), these rocks are arkoses.

COBALT GROUP

The Cobalt Group consists of the Gowganda Formation, the Lorrain Formation, the Gordon Lake Formation, and the Bar River Formation. The upper 2 formations, the Gordon Lake and the Bar River Formations, are absent from the Chiniguchi Lake Area. The Cobalt Group is the thickest Huronian Group in the current map area.

Gowganda Formation

The Gowganda Formation occurs in all 3 townships and unconformably overlies the older Huronian rocks. In Telfer Township, it is approximately 850 m (Figure 2, Chart A, back pocket) thick.

The formation is a heterogeneous sequence of conglomerate, arkose and wacke. Lateral and vertical lithological changes are common and the stratigraphic column of Figure 2 therefore is not representative of the Gowganda Formation of all the Chiniguchi Lake Area. The upper contact with the Lorrain Formation is transitional (Figure 2).

CONGLOMERATE

Paraconglomerate and orthoconglomerate occur along the shores of Telfer Lake in Telfer Township.

Paraconglomerate forms the bulk of the conglomerates. The clasts in both paraconglomerate and orthoconglomerate range in size from smaller than 1 cm to about 30 cm; however, clasts up to 1.5 m in diameter were also observed. Most of the clasts are those of granitic rocks. Gabbroic rocks, metavolcanics, and metasediments were also observed, but make up less than 5 percent of the fragments present. The clasts are subangular to subrounded, and are set in a greenish grey, massive wacke matrix. This matrix consists of quartz, feldspars, rock fragments, chlorite, epidote, and minor amounts of opaque minerals.

Photo 1 –Granite clast in Gowganda Formation Wacke. OGS 10 739

SANDSTONE

The Gowganda Formation sandstones occur in Telfer, northern McConnell Township, and southeastern DeMorest Township. Only in DeMorest Township do they underlie a more extensive area.

The sandstones are pink to grey, medium-grained arkose or subarkose. Bedding thicknesses range from about 1 cm to about 1 m. In thin section, the sandstones are seen to be composed of plagioclase, quartz, a small amount of microcline, and a chloritic matrix.

WACKE

Two types of wackes occur in the area, one is massive, the other is laminated. The massive variety in general is more abundant in the lower part of the formation. Both types are fine grained to very fine grained and are greenish grey to grey. The laminae are continuous or discontinuous over an outcrop, and exhibit various shades of grey and green. Rafted subangular pebbles, cobbles, and boulders occur in both wacke types, but are more abundant in the massive wacke (Photo 1).

Under the microscope, the wackes are seen to be composed of angular to subangular quartz and feldspar grains that range in size from less than 0.03 mm

OGS 10 740

Photo 2 –Quartz pebble bed in Lorrain Formation arenite.

to approximately 0.5 mm. These grains are set in a chlorite and epidote matrix. The lamination in the laminated wackes is caused by the interlayering of beds rich in silty quartz and feldspar with fine-grained chloritic beds.

Lorrain Formation

Sandstones of the Lorrain Formation underlie large sectors of all three townships. Just south of the present area (Dressler 1982) the formation is as much as 3400 m thick. In the Maple Mountain Area, to the north (Card *et al.* 1973) it is as much as 2300 m thick. In the current area, a reliable estimate of the thickness of the formation is not possible because of insufficient structural data.

In western Telfer Township, the basal unit of the Lorrain Formation (Figure 2) consists of approximately 70 m of arkosic wacke interbedded with silty wacke beds. It is overlain by massive arkose, arkosic wacke, subarkosic wacke, and wacke. These sandstones in general become more mature upwards in the stratigraphic column. The lower units are pinkish grey to grey, and are overlain by thickly bedded massive grey and greenish grey sandstone. A light grey to white quartz wacke to quartz arenite forms the top of the sequence in the area. Minor paraconglomerate beds (Photo 2) and lag gravel layers occur in all stratigraphic horizons of the formation. Clasts of the conglomerates and the lag gravel consist mainly of quartz and quartzite fragments. Fine-grained meta-

wacke and jasper clasts also occur. The matrix of the conglomerate beds consists of common Lorrain Formation sandstones.

A more detailed stratigraphy of the Lorrain Formation of an area just south of Telfer and McConnell Townships based on many modal analyses and better structural information was published by the author (Dressler 1982). To the north in the Maple Mountain Area, Card *et al.* (1973) described the stratigraphy of the Lorrain Formation. Sedimentary features observed within the rocks of the formation are; injections of wacke from underlying wacke beds into arkose, bedding, graded bedding, convolute bedding, and planar and trough crossbedding. The beds range in size from a few centimetres to 1.5 m. In places "herringbone" cross-stratification was also observed, that is crossbeds in which foreset laminae of adjacent crossbedded units dip in opposite directions.

Three Stratigraphic Sections Through Rocks of the Huronian Supergroup

In 1979 and 1980, 3 deep holes were diamond drilled by the Canico-Eldorado-Noranda-Texasgulf Joint Venture (Phipps 1979 and 1980) to explore for uraniferous and auriferous sedimentary rocks at the base of the Huronian Supergroup. The location of the diamond-drill holes are shown in Figure 2. The stratigraphic columns in Figure 2 and the following description of the rock units are based on the work by D. Phipps, Canico Limited staff geologist (Assessment File, 1979 and 1980). The sandstone terminology used by D. Phipps in the core logging is that proposed by Pettijohn (1975).

First deep diamond-drill hole.

In the Telfer Township drill hole, only rocks of the Lorrain, Gowganda, and Mississagi Formations were encountered. The Lorrain Formation consists of light grey massive arkosic wacke with minor silty wacke interbeds. This rather homogeneous unit grades into interbedded pelitic siltstone and arkosic wacke beds of the Gowganda Formation. The transition zone of the lower part of the Lorrain Formation consists of arkosic wacke with a downward increasing proportion of light grey narrow siltstone beds. Near the somewhat arbitrarily drawn contact with the Gowganda Formation, the transitional zone consists of approximately 50 percent siltstone beds.

The upper part of the Gowganda Formation is an interbedded sequence of pelitic siltstone, and arenaceous arkosic wacke. A thick arkosic wacke occurs at a length of 269 to 453 m. The lower part of the Gowganda Formation is characterized by the presence of thick tilloid layers that are interbedded with massive and laminated siltstone beds. Minor arenaceous beds also occur. The lower 90 m of the lower part of the Gowganda Formation consists of an interbedded sequence of siltstone and arkosic wacke.

The Mississagi Formation unconformably underlies the Gowganda Formation. The Bruce, Espanola, and Serpent Formations are absent. The Mississagi Formation consists of a thick sequence of predominantly arenaceous beds ranging in composition from quartzite through subarkose to arkosic wacke. Pelite and conglomerate beds are scarce; however, isolated pebbles occur throughout the arenites. The base of the Mississagi Formation consists of a rubble zone of basement fragments in a matrix of arkosic wacke. This rubble zone is approxi-

mately 1.5 m thick. The basement rocks consist of alaskite, gabbro, granodiorite and gneiss.

Second deep diamond-drill hole.

The position of the second drill hole is located on the western shore of Parsons Lake in southeastern DeMorest Township (Figure 2). The Serpent, Bruce, and Mississagi Formations were encountered in the hole. A diabase dike intrudes the Serpent Formation sandstones at a depth of approximately 380 m. A thick Nipissing gabbro body lies at the contact of the Serpent Formation with the Bruce Formation. The Espanola Formation is absent.

The Serpent Formation consists of a medium-grained subarkose, locally of quartz arenite and arkosic wacke. The upper units are weakly bedded and contain little disseminated pyrite. Below a depth of 550 m, the rocks are well bedded and locally exhibit silty interbeds. Calcareous arenite occurs in places below 762 m.

The Nipissing gabbro is approximately 400 m thick. It is very homogeneous, exhibits only minor variations in grain size, and contains widely spaced narrow quartz-carbonate veins. These veins host minor pyrrhotite-chalcopyrite mineralization.

Below the Nipissing gabbro, weakly foliated, matrix-supported paraconglomerate and pebbly wacke of the Bruce Formation occurs. Locally, the wacke is pyritiferous and contains approximately 10 to 20 percent clasts. Below a depth of 1346 m, it becomes cleaner and contains less pebbles. The base of the Bruce Formation is marked by a 6 m thick unit of well-bedded wacke and siliceous siltstone.

The Mississagi Formation is a medium-grained, grey subarkose to arkosic wacke. Siltstone beds occur at widely spaced intervals and quartz arenite occurs locally in the lower half of the formation. Disseminated sulphides commonly make up less than 1 percent. Narrow sections, however, may contain up to 5 percent. Conglomerates appear to be absent.

The basement rocks are overlain by a "silicified zone with abundant white quartz and quartzite" that is 67 m thick. It includes calcareous quartzite beds up to 0.6 m thick that contain small quartz pebbles.

The basement rocks were classified by D. Phipps (1980) as "well foliated chloritic arenite with abundant carbonate laminations and scattered quartzite clasts". These rocks include "thin zones of intermediate flow rock or crystal tuff".

Third deep diamond-drill hole.

In the third drill hole (Figure 2), a complete section across the lower Huronian Supergroup from the Serpent Formation to the Mississagi Formation was intersected.

The Serpent Formation, as in the drill hole 2, consists of grey arkose and arkosic wacke. Minor siliceous beds occur locally.

The Espanola Formation is a well laminated, thinly laminated limestone and calcareous siltstone unit. The limestone predominates in the upper part of the formation, siltstone in the lower part of the formation.

D. Phipps (1980) distinguished an upper Bruce Formation (270 to 537 m) and a lower Bruce Formation (537 to 757 m). The upper sequence consists of thick massive paraconglomerate beds that are separated by thinner beds of arenite and/or argillite-siltstone beds. The lower Bruce Formation is composed of

arkose and arkosic wacke interbedded with fine-grained wacke and siltstone. It contains a few pebble beds.

The massive, medium-grained, grey subarkose of the Mississagi Formation is intruded by 2 narrow (0.2 and 3.2 m) biotite lamprophyre dikes. The bedding is weakly developed in the subarkose. At the base of the formation, 6.5 m of polymictic conglomerate are underlain by approximately 54 m of pure quartzite and 4.5 m of wacke and siltstone.

The basement rocks consist of altered andesitic volcanics. Interflow breccias, and local fine-grained quartz-carbonate veins also occur.

MAFIC INTRUSIVE ROCKS

Nipissing Gabbro[1]

The Nipissing gabbro intrudes the rocks of the Huronian Supergroup and older rocks of the Southern Structural Province in an area extending approximately from Sault Ste Marie to Cobalt, Ontario. The radiometric age of the gabbro is approximately 2160± 50 Ma (Van Schmus 1965; Fairbairn *et al.* 1967).

In the map area, the Nipissing gabbro occurs in central and northeastern DeMorest Township. In central Telfer Township a fine- to medium-grained gabbro dike occurs. It is olivine free and therefore, has been classified, somewhat arbitrarily, as Nipissing gabbro.

The Nipissing gabbro is a medium-grained, dark greenish grey to dark grey, green to brown weathering rock. It is composed of plagioclase (An 45-65), clinopyroxene, orthopyroxene, and opaque minerals. Quartz, biotite and apatite are commonly present as well. Alteration products are actinolite, chlorite, epidote, leucoxene and saussurite.

Card *et al.* (1973) and Dressler (1982) studied the Nipissing intrusive rocks north and south of the present area in greater detail and the reader is referred to these authors for more information.

LATE PRECAMBRIAN

OLIVINE DIABASE

Two olivine diabase dikes occur in the map area. They are post-Hudsonian in age, and were radiometrically age-dated at approximately 1280 Ma (Van Schmus 1965). There has been minor post-olivine diabase faulting in the area (*see* Map 2468, back pocket).

[1]In Dressler (1982) Nipissing Gabbro is part of the Nipissing Intrusive Rocks.

The olivine diabase in the map area is a medium-grained, grey, commonly brownish to rusty weathering rock. It is composed of calcic plagioclase (An 62-72), augite, olivine, biotite, titano-magnetite and apatite in this approximate order of decreasing abundance.

PHANEROZOIC

Cenozoic

QUATERNARY

Pleistocene and Recent

The map area was subjected to glaciation during the Pleistocene. Glacial processes have scoured and eroded the bedrock and deposited a discontinuous mantle of ground moraine and glaciofluvial deposits.

The direction of the ice movement was about 170° to 190°. At a few locations 2 sets of striation were observed. The angle between the two directions is 10 to 20° only.

The Pleistocene deposits include eskers, unsorted boulder tills, sand and gravel. Recent sediments of sand and gravel occur in the East Wanapitei River valley. Swamps were encountered in many locations of the map area.

STRUCTURAL GEOLOGY

Regional Structure

The Chiniguchi Lake Area can be subdivided into 2 structural zones. The first is characterized by folding and faulting that is stronger than in the second structural zone. This second zone makes up almost all the map area. In it, the Huronian rocks are only weakly deformed and in general form a large synclinorium in McConnell and Telfer Townships. The axis of it strikes approximately north. The synclinorium is disrupted by several north striking faults (Figure 3).

A deformational event that took place prior to the deposition of the Gowganda Formation rocks is responsible for the stronger deformation in northeastern DeMorest Township. The structures outlined by rocks of the Cobalt Group therefore do not reflect the structures of the underlying pre-Cobalt Group rocks. This observation is not new. It has been made already by Card *et al.* (1973, p.52), Wood (1979), and by the author (Dressler 1982), who in 1977

and 1978 investigated the Lake Wanapitei Area south of the present area. In Scadding Township, south of Lake Wanapitei where the pre-Gowganda rocks re-appear from under the Cobalt Group cover, the deformational style is similar to that of northeastern DeMorest Township.

Breccia

Breccias that are similar to the Sudbury Breccia were observed in several places within the map area. They occur along faults, for instance, the approximately northerly striking Laundry Lake Fault. In other places, for instance north of McConnell Bay of Chiniguchi Lake, they appear to be unrelated to any discernible structural features. Along the Laundry Lake Fault, breccias can be observed over a distance of more than 10 km, for example, in the present area and south of it (Dressler 1982). North of McConnell Bay, all outcrops in an area 1.0 km by 1.5 km large are brecciated.

Rock fragments within the breccias of the area range in size from less than 1 cm to about 1 m. These are subangular to rounded, and consist mainly of host rocks. Fragments of underlying or overlying formations and of Nipissing diabase may also occur. The matrix of the breccias is grey to dark grey, commonly exhibits flow lines around fragments, intrudes into fine cracks in inclusions and the host rock, and consists of a very fine grained rock flour.

The origin of the breccias occurring along faults is certainly tectonic. The tectonism and the emplacement of the breccias that cannot readily be related to any discernible structural features, are possibly related to the catastrophic "Sudbury Event" and to large scale crustal readjustments after this event. The "Sudbury Event" was a large volcanic explosion or the impact of a meteorite that occurred approximately 1.8 to 1.9 Ma ago.

CORRELATIONS OF AEROMAGNETIC DATA WITH BEDROCK GEOLOGY

On examination of Aeromagnetic Maps 1512G Milnet and 1513G Pilgrim Creek (Geological Survey of Canada 1964, 1965), it is apparent that most aeromagnetic features in the Chiniguchi Lake Area cannot be related to bedrock geology.

McConnell and Telfer Townships lie at the western end of a very strong aeromagnetic high of 11000 gammas. The centre of this anomaly lies near Emerald Lake in Afton Township approximately 20 km east of the map area. This strong anomaly causes the rather homogeneous pattern of isomagnetic lines over McConnell and Telfer Townships and obliterates all aeromagnetic features that might be related to surface bedrock geology.

In DeMorest Township, a moderate aeromagnetic high of 2260 gammas is located northeast of Dougherty Lake and is probably related to an underground extension of the Nipissing gabbro body that is exposed south and east of this lake. Rather dense isomagnetic lines with a westward positive gradient of 200

gammas per 1 km strike approximately parallel to the northeast strike of the Nipissing gabbro. Northwestern and northeastern DeMorest Township show a very flat aeromagnetic relief.

ECONOMIC GEOLOGY

Exploration has been carried out sporadically for copper, gold, and uranium in the map area. Most efforts were directed towards northeastern DeMorest Township where pre-Cobalt Group Huronian rocks are exposed.

Copper and Zinc

KENNCO EXPLORATIONS (CANADA) LIMITED (4)

Several small blasted pits were observed by the author's field assistants in Nipissing gabbro near contacts with Huronian sedimentary rocks just east of Dougherty Lake in DeMorest Township. The rocks at the pits show disseminated sulphide mineralization of up to approximately 3% combined pyrite, pyrrhotite, and chalcopyrite. Not all of the small exposures are mineralized and the extent of the mineralizations is not known to the author. The author also does not know when and by whom the pitting was done. The pits are located in the general area where in 1970, Kennco Explorations (Canada) Limited diamond drilled 8 holes for a total length of 203 m. The company reported assays of up to 0.23% copper, up to 1.50% zinc and traces of silver over a core length of 1.5 m.

Gold

D. HINDS (7)

D. Hinds presently (December 31, 1980) holds 1 mining claim north of Laura Lake in McConnell Township where in 1978 he did some trenching and blasting. D. Hinds (personal communication 1980) found traces of visible gold in quartz veins on his property. The exact location of the trenches and the quartz veins is not known to the author. The approximate location of the claim is shown on the geological map that accompanies this report (Map 2468, back pocket).

Gold and Uranium

AGGRESSIVE MINING LIMITED (1), H.V. BARRY (2), AND J.V. LUPO (5)

Exploration for Elliot Lake type uranium mineralization has been carried out sporadically in northeastern DeMorest Township where pre-Cobalt Group Huronian rocks are exposed and where Aggressive Mining Limited presently (December 31, 1980) holds 3 mining claims, H.V. Barry another 3 claims, and J.V. Lupo 16 claims. Card *et al.* (1973) described the exploration activities carried out until 1969 in this sector of the map area. No information is available in the assessment files on more recent work.

CANADIAN NICKEL COMPANY LIMITED (3) and (6)

In a joint venture with Eldorado Nuclear Limited, Noranda Mines Limited, and Texasgulf Canada Limited, Canadian Nickel Company Limited the exploration arm of Inco Limited, diamond drilled 3 holes (*see* Figure 2) in search of uranium and gold mineralization at the base of the Huronian sequence.

In the first diamond-drill hole, no radioactive sedimentary rocks and no gold mineralization were encountered. In the other two holes traces of uranium and gold were found. The results from the more economically interesting sections of the 2 holes are summarized in Table 2.

SUGGESTIONS FOR MINERAL EXPLORATION

No mineralized showings of economic significance were discovered during the present investigations. This does not mean that the area is unfavourable to mineral exploration.

Exploration for uranium in the basal Huronian rocks in northeastern DeMorest Township has not been successful to date. Low but interesting levels of uranium and gold, however, are present near the Archean-Proterozoic unconformity as shown by the exploratory drilling by the Canadian Nickel Company Limited. A large scale drilling project in the Huronian rocks would be required to adequately determine the potential of these rocks. A program of this nature should keep in mind the structural contrast that exists between the Huronian Hough and Quirke Lake Groups and formations of the Huronian Cobalt Group.

Gold is present in breccias, chloritized breccias, and quartz stockworks and veins south of the current area (Dressler 1982). The breccia zones within the current area should be examined, especially the large breccia zone at the northern end of Chiniguchi Lake.

TABLE 2 | GOLD AND URANIUM IN ROCKS OF THE HURONIAN SUPERGROUP IN DEMOREST TOWNSHIP, CHINIGUCHI LAKE AREA.

Gold (oz/ton)	Uranium (ppm U)	Depth (m)	Host Rock	Formation	Length (m)
0.031	1.6	149.7	Arenite	Serpent	0.6
0.004	9.8	194.5	Arenite	Serpent	0.2
—	41.7	1469.7	Wacke		1.2
—	41.3	1566.1	Wacke		0.7
—	41.7	1581.6	Wacke	Mississagi	1.5
—	50.7	1641.3	Wacke		0.2
—	35.5	1700.8	Wacke		1.5
0.032	19.1	1761.1	Wacke		0.6

End of Hole: 1886.1m

Gold (oz/ton)	Uranium (ppm U)	Depth (m)	Host Rock	Formation	Length (m)
—	34.0	975.5	Wacke		0.6
—	38.0	1108.7	Wacke		0.3
—	38.0	1109.5	Wacke		0.8
—	42.0	1113.1	Siltstone		0.6
0.012	2.0	1262.8	Subarkose		0.3
0.026	24.0	1263.5	Polymictic conglomerate	Mississagi	0.7
0.008	6.0	1264.5	Wacke		1.0
0.003	43.0	1264.7	Wacke		0.2
0.002	78.0	1266.4	Polymictic		0.7
0.012	36.0	1267.4	pebble con-		0.4
0.004	2.0	1268.3	glomerate		0.9
0.005	1.0	1268.9			0.6

End of Hole: 1493.3m

Notes
Based on Assessment File 831-129 by D. Phipps (1980)
Uranium values > 30 ppm U only are reported here
For location of diamond-drill holes *see* Figure 2.

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Ontario Geological Survey
Map 2468
DeMorest, Telfer and McConnell Townships

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Geology is not tied to surveyed lines.

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Cartography by C. G. McLean and assistants, Surveys and Mapping Branch, 1982

Basemap derived from Forest Resources Inventory Maps, Ontario Ministry of Natural Resources, with additional information by B. Dressler

Magnetic declination in the area was approximately 9° 03' W in 1979.

Parts of this publication may be quoted if credit is given. It is recommended that reference to this map be made in the following form:

Dressler, B.
1984 DeMorest, Telfer and McConnell Townships; Ontario Geological Survey, Map 2468, Precambrian Geology Series, scale 1 inch to ½ mile, Geology 1979

Ministry of Natural Resources
Ontario

SYMBOLS

- Glacial striae. Glacial fluting or drumlin
- Esker.
- Bedrock, (small outcrop, area of outcrop)
- Bedding, horizontal.
- Bedding, top unknown; (inclined, vertical)
- Bedding, top indicated by arrow; (inclined, vertical, overturned)
- Bedding, top (arrow) from grain gradation, (inclined, vertical, overturned)
- Bedding, top (arrow) from cross bedding, (inclined, vertical, overturned)
- Bedding, top (arrow) from relationship of cleavage and bedding, (inclined, overturned)
- Lava flow, top (arrow) from pillows shape and packing. Lava flow, top in direction of arrow.
- Direction of paleocurrent.
- Schistosity, (horizontal, inclined, vertical)
- Gneissosity, (horizontal, inclined, vertical)
- Foliation, (horizontal, inclined, vertical)
- Banding, (horizontal, inclined, vertical)
- Lineation with plunge.
- Geological boundary; (observed, position interpreted, deduced from geophysics).
- 1000γ MA — Magnetic contour value in gammas. Magnetic attraction.
- Fault, (observed, assumed). Spot indicates down throw side, arrows indicate horizontal movement
- Lineament
- Jointing, (horizontal, inclined, vertical)
- Drag folds with plunge.
- Anticline, syncline, with plunge
- Drill hole, (vertical, inclined, projected vertically, projected up dip) Overburden shown.
- Location of sample.
- Vein, vein network. Width in inches or feet.
- Ra Radioactivity.
- Swamp.
- 69 — Motor road. Provincial highway, number encircled where applicable.
- Other road. Trail, portage, winter road.
- International or Provincial boundary.
- County, District, Regional or District Municipal Boundary, with mile post.
- Municipal Boundary, (City, Town, Improvement District, Incorporated Township), with milepost.
- Township, Indian Reserve, Meridian, Base Line, Provincial Park, with milepost, (surveyed, unsurveyed)
- 2 ① — Mining property, surveyed. Mineral deposit or mining property, unsurveyed.
- Surveyed line. Unsurveyed line.

All boundary and survey lines are approximate position only.

Some symbols may not occur on this map.

PROPERTIES, MINERAL DEPOSITS

DeMOREST TOWNSHIP
1. Aggressive Mining Ltd.
2. Barry, H. V.
3. Canadian Nickel Company Ltd.
4. Kerrnco Explorations (Canada) Ltd.
5. Lupo, J. V.

TELFER TOWNSHIP
6. Canadian Nickel Company Ltd.

McCONNELL TOWNSHIP
7. Hinds, D.

Information current to December 31, 1979.

Former properties on ground now open for staking are only shown if exploration data is available.

LEGEND

PHANEROZOIC

CENOZOIC[a]

QUATERNARY
PLEISTOCENE AND RECENT
Gravel, sand, silt, swamps

UNCONFORMITY

PRECAMBRIAN[b]

LATE PRECAMBRIAN
MAFIC INTRUSIVE ROCKS
8 Olivine diabase

INTRUSIVE CONTACT

MIDDLE PRECAMBRIAN
MAFIC INTRUSIVE ROCKS
7 Gabbro (Nippissing)

INTRUSIVE CONTACT

HURONIAN SUPERGROUP
COBALT GROUP
LORRAIN FORMATION[cd]
6a Grey arkose, subarkosic wacke, arkosic wacke
6b Greenish grey arkose, subarkosic wacke, arkosic wacke
6c Pink, pinkish grey arkose, subarkosic wacke, arkosic wacke
GOWGANDA FORMATION[c]
5a Polymictic paraconglomerate
5b Arkose, subarkose
5c Wacke
5d Laminated wacke
QUIRKE LAKE GROUP
SERPENT FORMATION[c]
4a Arkose
4b Wacke
ESPANOLA FORMATION
3 Limestone, silty mudstone
BRUCE FORMATION
2 Polymictic conglomerate
HOUGH LAKE GROUP
MISSISSAGI FORMATION
1 Quartz wacke, subarkosic wacke
Breccia

Ag Silver
Cu Copper
Zn Zinc

[a]Unconsolidated deposits. Cenozoic deposits are represented by the lighter coloured parts of the map.

[b]Bedrock geology. Outcrops and inferred extensions of each rock unit are shown respectively in deep and light tones of the same colour.

[c]Lithologies not in stratigraphic order.

[d]6a to 6c may include quartz wacke, minor wacke and conglomerate.

NOTE

For section A—B refer to Chart 'A', Figure 3, and text.

Ontario Geological Survey

Map 2468

DeMOREST, TELFER AND McCONNELL TOWNSHIPS

SUDBURY DISTRICT

Scale 1:31,680 or 1 Inch to ½ Mile

Chains 80 60 40 20 0 1 2 Miles
Metres 1000 0 1 2 3 Kilometres
Feet 1000 0 5,000 10,000 Feet

Published 1984

Adjoins Map 2238

TURNER

STOBIE II

CLARY II

FRALECK II

SHEPPARD

Dougherty Creek
Frederick Lake
Dougherty Lake
Button Lake
Adelaide Lake
Paradise Lake
Camp Two Lake
Seahorse Lake
Davis Lake
Telfer Lake
Telfer Bay
Chiniguchi Lake
Caribou Lake
Musko Bay
McConnell Bay
Southwest Bay
Southeast Bay
Shed Lake
Dewdney Lake
Alma Lake
Laura Lake
Marion Lake
Evelyn Lake
Marjorie Lake
Rawson Lake
Pinards Creek
Sturgeon Creek
Lawson Creek
Winnipini River
Chiniguchi River

DeMOREST
TELFER
McCONNELL
AYLMER
MACKELCAN

MARCONI TP | TURNER TP | SEAGRAM TP | STOBIE TP | DeMOREST TP | CLARY TP | TELFER TP | AYLMER TP | McCONNELL TP | MACKELCAN TP

Lrn | Gwg | Srp | Esp | Brc | Nps | Mss

122.2 | 400 | 800 | 895.2 | 1140.2 | 1290.2 | 1365.8 | 1568.6 | 1600 | 1761.1 | 227.1 | 270.0 | 757.7 | 1200 | 1330.7 | (1624.1) | (1886.1) | (1439.3)

Paradise Lake | Dougherty Lake | Alma Lake | McCrown Lake | Josephine Lake | Telfer Lake | Chiniguchi Lake | Southeast Bay | McConnell Lake | Laura Lake | Rawson Lake

1 | 2 | 3

0 1 2 3 Miles
0 1 2 3 4 Kilometres

LEGEND

7 Nipissing diabase (Nps)
6 Lorrain Fm. (Lrn)
5 Gowganda Fm. (Gwg)
4 Serpent Fm. (Srp)
3 Espanola Fm. (Esp)
2 Bruce Fm. (Brc)
1 Mississagi Fm. (Mss)
Geological contact
Fault

SYMBOLS

Arkosic arenite, arkose, subarkose. (minor arkosic wacke)
Wacke, arkosic wacke. (minor arkosic arenite and subarkose)
Siltstone and argillite.
Nipissing Diabase.
Conglomerate.
Limestone.
Tillite.
Basement gneiss.
Basement volcanics.
Bx Sudbury breccia.

Figure 2. Three stratigraphic sections through the Huronian Supergroup, in the Chiniguchi Lake Area.

West | East | A | B | 450 m | 375 m | 300 m

Telfer Lake | Chiniguchi Lake | Marjorie Lake

55° 30° 55° 65° 15° 10° 35° 25° 45° 30° 60° 85° 10° 30° 20° 60° 60° 80°

5c 5d 5a 5b 5c 8a 8b 8c 6c

dip of bedding | F | F

0 1 2 Miles
0 1 2 3 Kilometres

Figure 3. Structural cross-section of the Chiniguchi Lake Area.

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